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ILLUSTRATIONS OF FUNGI—XIX

WILLIAM A. MURRILL

The accompanying illustrations,[1] including the two halftone plates, were all made from specimens collected in and near New York City. Four of the species described are known to be edible, one of them, *Agaricus arvensis,* being an important edible species in many parts of Europe.

Collybia radicata (Relh.) Quél.

ROOTING COLLYBIA

Plate 137. Figure 1. × 1

Plate 138. Slightly reduced

Pileus fleshy, thin, convex to nearly plane, 3–7 cm. broad; surface smooth, viscid when moist, often radiate-rugose, grayish, grayish-brown, or umbrinous, the center usually darker; context white; lamellae white, broad, rather distant, adnexed; spores ellipsoid, hyaline, with a slight oblique apiculus at one end, 15–17 × 10–12 μ; stipe long, with a very long root, slender, firm, generally slightly tapering upward, stuffed, white above, concolorous or slightly paler below, 10–20 cm. long, 4–8 mm. thick.

This common and widely distributed edible species may be looked for in open deciduous woods. In the vicinity of New York City, the typical form figured occurs most frequently about beech stumps and under beech trees, and the long rooting base of the

[1] The colored plate to accompany this article was being made in England and has not yet come to hand. It will be distributed with the next number of MYCOLOGIA.

[MYCOLOGIA for July, 1914 (6: 161–220), was issued July 14, 1914.]

stipe can usually be traced to a dead root, from which the plant derives its chief supply of nourishment.

Agaricus arvensis Schaeff.

HORSE MUSHROOM. FIELD MUSHROOM

Plate 137. Figure 2. × 1

Pileus large, convex, 6–15 cm. broad; surface white, becoming yellowish with age or on drying; context white, thick, highly flavored and easily digested; lamellae white to pale-pinkish at first, at length brown; spores ellipsoid, smooth, brown, 9–11 × 6 μ; stipe long, white, often enlarged at the base, 5–10 cm. long, 8–16 mm. thick; annulus of two parts, membranous and white above, radiately split and tinged with yellow below.

This species grows in rich soil in pastures, fields, and wood borders from midsummer to early fall. It resembles the common mushroom, but is larger, with longer stipe, paler lamellae, and a peculiar double annulus. I have often eaten it in Sweden and found it delicious. The slender, wood-loving *Agaricus silvicola* can hardly be distinguished from it at times.

Agaricus silvicola Vitt.

FOREST MUSHROOM

Plate 139. × ½

Pileus convex or expanded, 5–12 cm. broad, all parts of the plant except the lamellae being white at first and becoming tinged with straw-color in places with age or almost entirely on drying; surface smooth, glabrous or slightly silky; context white; lamellae thin, close, rounded behind, free, pale-reddish-gray when young, becoming darker with age, and finally brown or blackish-brown with a chestnut tint; spores ellipsoid, brown, 7.5 × 4 μ; stipe long, equal, smooth, stuffed or hollow, bulbous, white, 10–20 cm. long and 6–10 mm. thick; veil usually single, forming a thin, membranous annulus decorated with floccose patches below.

This beautiful edible species is of wide distribution, but unfortunately not very abundant. It occurs in open woods and wood borders, in rich soil or vegetable mold. Its smaller size and more simple veil distinguish it from *A. arvensis*.

AGARICUS SILVICOLA VITT.

Lepiota brunnescens Peck

BROWNING LEPIOTA

Plate 137. Figure 4. × 1

Pileus thin, convex or nearly plane, usually obtuse or umbonate, 2–8 cm. broad; the entire plant changing to brown when bruised or after 12–24 hours of drying; surface whitish, the cuticle soon cracking and forming chestnut-colored squamules except in the center, margin often rosy, radiate-rimose at times; context white, taste sweet; lamellae free, at first white, crowded, ventricose; spores ovoid, appendiculate, smooth, hyaline, yellowish in mass, 6–8 × 4–5 μ; stipe equal or slightly enlarged below, white, changing at first to reddish-brown and then to brown below the annulus on drying, fibrous to glabrous, hollow, 3–7 cm. long, 2–7 mm. thick; annulus median, fixed, usually ample and persistent.

This species occurs rather rarely in open woods and grassy places from New York and New Jersey through Ohio and Missouri to southern California. Few collectors know it on sight, but it should be recognized by the brown color which the entire sporophore assumes after about a day of drying. The flesh is white, sweet, and probably edible, but it has not been tested so far as known. The species might be confused by the beginner with small plants of *Lepiota americana*.

Laccaria ochropurpurea (Berk.) Peck

YELLOWISH-PURPLE LACCARIA

Plate 137. Figure 5. × 1

Pileus fleshy, firm, subhemispheric or convex becoming plane or slightly centrally depressed, often very irregular and very variable in size and shape, solitary or rarely gregarious, 5–10 cm. broad; surface hygrophanous, purplish-brown when moist, grayish or pale-alutaceous when dry, unpolished, margin decurved; context edible; lamellae thick, distant, broad, adnate or decurrent, purplish; spores globose, verruculose, 8–10 μ; stipe variable, short or long, equal or sometimes thicker in the middle, sometimes at each end, fibrous, solid, concolorous or paler, firm, 3–8 cm. long, 4–12 mm. thick.

This species is known throughout temperate North America, occurring in open grassy or bushy places in thin woods, often associated with its smaller relative, *Laccaria laccata*, of which it

has at times been considered only a larger form. It is edible, but of only tolerable flavor.

Inocybe geophylla (Sow.) Quél.

COMMON WHITE INOCYBE

Plate 137. Figure 6. × 1

Pileus fleshy, thin, conic or ovoid becoming expanded, conically umbonate, 1.5–2.5 cm. broad; surface silky-fibrillose, smooth, commonly white or whitish, rarely lilac; lamellae crowded, rather broad, ventricose, adnexed, white becoming clay-colored; spores ellipsoid, smooth, ochraceous, 8–10 × 4–6 μ; cystidia cylindric-fusoid, 40–60 × 12–20 μ; stipe equal, firm, stuffed, white, mealy at the apex, 2.5–6 cm. long, 2–4 mm. thick.

This species is common on heavy, wet soil on the shaded banks of streams or in low open woods throughout temperate regions. It is so different from most species of *Inocybe* that the beginner is usually puzzled in identifying it. A beautiful pale-lilac variety sometimes occurs, which Boudier has figured in his plate 125. I have found this variety quite abundant in the state of Washington.

Scleroderma verrucosum (Bull.) Pers.

SMALL-WARTED SCLERODERMA

Plate 137. Figure 7. × 1

This rather uncommon species was described and figured in MYCOLOGIA for January, 1910. The illustration on the plate accompanying the present article is made from younger material, and the plants have more purple in them than those represented on the former plate.

Tremella lutescens Pers.

COMMON YELLOW TREMELLA

Plate 137. Figure 8. × 1

Very soft and watery, undulate-gyrose, with entire, naked lobes, the clusters sessile, whitish to pale-yellowish, and finally luteous, 1–5 cm. broad, leaving a very small residue when dried; spores globose, 12–15 μ.

This species is widely distributed, occurring commonly on dead

branches of both deciduous and evergreen trees in woods or moist places. The genus *Tremella* contains fungi that are gelatinous, tremulous, immarginate, not papillate, with basidia that become four-parted, each part bearing a single spore. The species must be collected during wet weather, otherwise they will not be seen. After drying, they may be soaked in water to restore them to their original form. Members of closely related genera, such as *Exidia, Dacryomyces,* and *Hirneola,* are liable to be confused with species of *Tremella* by the beginner.

Mycena succosa Peck

JUICY MYCENA

Plate 137. Figure 9. × 1

Pileus firm, between cartilaginous and fleshy, campanulate or convex, cespitose, 2–4 cm. broad; surface minutely tomentose, cinereous or very pale reddish-gray, darker at the center, the margin exceeding the lamellae and incurved; context abounding in a thin watery or serum-like juice, changing to purplish and black when cut; lamellae slightly ascending, thin, close, emarginate with a slight decurrent tooth, tapering toward the outer extremity, whitish with a pale-reddish-gray tint; spores subglobose, minute, 4 μ; stipe firm, equal or slightly tapering upward, often curved, minutely tomentose, containing a whitish pith, pale-reddish-gray at the apex, dark-reddish-gray below, 4–8 cm. long, 2–3 mm. thick.

This extremely interesting little species occurs in woods on fallen decayed trunks of deciduous trees. When wounded, it exudes a serum-like fluid which blackens on exposure to the air. The sporophore therefore soon becomes spotted with black when handled and usually turns black on drying, as in the Indian Pipe. *Mycena haematopa* is a related species which exudes a dull-reddish juice when wounded.

NEW YORK BOTANICAL GARDEN.

A NEW GYMNOSPORANGIAL CONNECTION

F. D. Fromme

The genus *Gymnosporangium*, according to Kern,[1] is represented in North America by some 32 species. Of these, all but one are heteroecious, the aecial stages being found on members of the Hydrangeaceae, Rosaceae, and Malaceae families, while the telial stages are restricted to the family Juniperaceae. The single autoecious species, *Gymnosporangium bermudianum*, bears all its spore forms on species of *Juniperus*. Because of this limited selection of hosts, as well as their unique morphological characters, the members of this genus have been classed among the most restricted and isolated of the rusts. Until recently, no aecial stages were known on other than pomaceous hosts and it had been assumed that they were restricted to the family Malaceae. The first exeception to this rule was established by Arthur[2] in 1908 when *Gymnosporangium exterum* on *Juniperus virginiana* was successfully cultured on *Porteranthus stipulatus*, thus adding the family Rosaceae to the list of aecial hosts. The further addition of the family Hydrangeaceae was made by Arthur[3] in 1911 when *Gymnosporangium gracilens* was shown to have its aecial stage on *Philadelphus* and related genera. These three families are evidently closely related and are all included under the order Rosales.

As a result of a series of observations, followed by successful inoculation tests, the writer is now able to extend the list to include a fourth family, the Myricaceae, and to establish the identity of *Aecidium myricatum* Schw. and *Gymnosporangium Ellisii* (Berk.) Farl. This work is a part of the series of "Cultures of Uredineae" that have been in progress at the Purdue Experiment Station under the direction of Dr. J. C. Arthur since 1899, and is published by permission in advance of the 1914 report.

The establishment of the connection between *Aec. myricatum*

1 N. Am. Flora 7: 188–211. 1912.
2 Mycologia 1: 253–254. 1908.
3 Mycologia 4: 63. 1911.

and *Gym. Ellisii* not only carries the aecial hosts of the genus to a group outside of the Rosales but to one that is apparently widely separated from them in phylogeny, the Myricales being the fourth order of Dicotyledoneae in Engler and Prantl's Natürliche Pflanzenfamilien, while the Rosales is the eighteenth. This is not in itself so surprising, as similar wide ranges of hosts are known in other rust genera. It shows, however, that the species of *Gymnosporangium* are a much less restricted group than was formerly supposed, and suggests the possibility that the aecial hosts of other unconnected species may also be found in groups other than Rosales.

The aecium of *Aec. myricatum* is of the cupulate type, a type which has only recently been recognized as occurring in the genus *Gymnosporangium* and is at present known in but two species, *G. Blasdaleanum* and *G. Sorbi*, in addition to the one under discussion. The remaining species of *Gymnosporangium* have aecia of the cornute type, which had for a long time been considered exclusively diagnostic of the genus. *G. Ellisii* in addition to its cupulate aecia has the hamaspora or phragmidium type of teliospores, in which the teliospore has commonly more than two cells, the variation being from two to five. *G. Blasdaleanum* also has cupulate aecia and teliospores of the hamaspora type, but *G. Botryapites* has teliospores much like those of the two foregoing species and cornute aecia. The telial stage of *G. Sorbi*, of which the aecia are cupulate, is unknown.

The suggestions that have led to the establishment of this connection were obtained from a morphological study of the aecium supplemented by field observations on the association of hosts. A quantity of the aecium on *Myrica carolinensis* was collected at Woods Hole, Mass., in 1912, by the writer, for a morphological study. The evident germ pores of the aeciospores and other features suggested that it might possibly be the aecium of a *Gymnosporangium*. In May of the following year, 1913, Dr. R. A. Harper, Dr. B. O. Dodge, and the writer made a trip to the pine barrens at Lakehurst, N. J. Both *Gym. Ellisii* and *Gym. Botryapites* were found there in abundance on the southern white cedar, *Chamaecyparis thyoides*, and three possible alternate hosts, *Amelanchier canadensis, Aronia arbutifolia*, and *Myrica carolinensis*

were found in the vicinity. After a search, old aecia were found on Myrica leaves of the preceding year. Material of both species of *Gymnosporangium* was taken to New York City. *Gym. Ellisii* was sown there on *Aronia arbutifolia, A. nigra,* and several species of *Crataegus* without result. No *Myrica* plants were available for use. *Gym. Botryapites* was sown on *Amelanchier canadensis* and *A. Asiatica* and produced pycnia and aecia on both. The Lakehurst region was again visited in August of the same year and aecia were found on *Amelanchier, Aronia,* and *Myrica.* The aecium on *Amelanchier* proved to be that of *Gym. Botryapites,* the one on *Aronia* was *Roestelia transformans,* and that on *Myrica, Aecidium myricatum.* Since *Gym. Ellisii* had failed to infect *Aronia* in the trials made at New York, it seemed probable that *Myrcia* would prove to be its alternate host. This solution would still leave *Roestelia transformans* without a telial connection and another *Gymnosporangium* should be present in the vicinity.

A third trip to Lakehurst was made this spring, May 1914, and a quantity of *Gym. Ellisii* was obtained and sent to the Purdue Experiment Station for culture work. The germinating teliospores were sown, May 6, on *Aronia arbutifolia, Amelanchier canadensis,* and *Myrica cerifera.* The sowings were made by Mr. C. A. Ludwig, who was in charge of the rust cultures at that time. Although the leaves of the Myrica were quite small at the time of inoculation, a vigorous infection resulted, and an abundance of pycnia were produced on May 18, and aecia on June 6. No infection was produced on either of the other trial hosts.

The distribution of *Aec. myricatum* conforms with that of *Gym. Ellisii* in that both are found along the Atlantic coast from Massachusetts to Delaware. The latter, however, is also known from northern Florida and southern Alabama, while *Aec. myricatum,* so far as I can ascertain, has not been collected at any point south of Delaware.

Aecidium myricatum was named and briefly described by Schweinitz, in 1832, from a specimen on *Myrica cerifera* sent him from New York by Dr. Torrey. This description has been amplified somewhat by DeToni in Saccardo's Sylloge Fungorum but is

still incomplete. I am therefore appending a description of the pycnia and aecia with the complete synonomy of the combined species and its distribution. The first name applied to the telial stage was *Podisoma Ellisii* Berk., in 1874; which was, however, antedated by the Schweinitzian name.

Gymnosporangium myricatum (Schw.) comb. nov.

Caeoma (*Aecidium*) *myricatum* Schw. Trans. Am. Phil. Soc. II. **4**: 294. 1832.

Aecidium myricatum Schw. Trans. Am. Phil. Soc. II. **4**: 309. 1832.

Podisoma Ellisii Berk. Grevillea **3**: 56. 1874.

Hamaspora Ellisii Körn. Hedwigia **16**: 23. 1877.

Gymnosporangium Ellisii Earl.; Ellis, N. Am. Fungi *271*. 1879.

Phragmidium Ellisii DeToni, in Sacc. Syll. Fung. **7**: 750. 1888.

Tremella Ellisii Arth. Proc. Ind. Acad. Sci. **1900**: 135. 1901.

O. Pycnia epiphyllous, gregarious, in crowded circular groups. 2–5 mm. in diameter, on blackened areas, subepidermal, orange-yellow, globose in vertical section, 140–190 μ broad by 175 μ deep; ostiolar filaments 30–80 μ long.

I. Aecia hypophyllous, fructicolous and caulicolous, in crowded groups, on discolored hypertrophied areas, cupulate, 0.2–0.3 mm. in diameter; peridium yellowish, fragile, becoming lacerate to the base, slightly recurved; peridial cells oblong, 26–29 by 32–39 μ, overlapping, the outer wall thick, 7–10 μ, smooth, transversely striate, the inner wall much thinner, 2–3 μ, closely and prominently verrucose; aeciospores globoid to oblong, 24–30 by 27–34 μ, the wall pale-yellow or colorless, 2–3 μ thick, closely and strongly verrucose, the pores 6–8, scattered.

ON MYRICACEAE:

Myrica carolinensis Mill., Connecticut, Massachusetts, New Jersey.

Myrica cerifera L., Delaware, New Jersey, New York.

III. Telia. (For description see N. Am. Flora **7**: 203. 1912.)

ON JUNIPERACEAE:

Chamaecyparis thyoides (L.) B.S.B., Alabama, Delaware, Florida, Massachusetts, New Jersey.

TYPE LOCALITY: New York, on *Myrica cerifera*.

DISTRIBUTION: Along the Atlantic coast from Massachusetts to Delaware, and in northern Florida and southern Alabama.

EXSICCATI: Ellis N. Am. Fungi *230, 271*; Ellis & Ev. Fungi Columb. *55, 62*; Thüm. Myc. Univ. *1224, 1936*; Seym. & Earle, Econ. Fungi *246*; Roum. Fungi Sel. *4921*; Rab.-Wint. Fungi Eur. *2920;* Barth. Fungi Columb. *4001*.

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TYPE STUDIES IN THE HYDNACEAE[1]—VII. THE GENERA ASTERODON AND HYDNOCHAETE

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The genus *Asterodon* is monotypic, having been established by Patouillard in 1894 on *A. ferruginosum* Pat.[2] The genus may be characterized as follows:

Hymenophore epixylous, perennial, wholly resupinate, separable, umber to fulvous; substance dry, fibrous, concolorous; hymenium setulose with reddish straight, simple or branched setae; teeth slender, terete, tapering; spores hyaline, smooth; hyphae slender, somewhat rigid, non-septate.

The presence and character of the setae is one of the distinguishing features of the genus. They are modified free ends of single hyphae which may project as simple spines or may branch at right angles into three or four spines giving a stellate appearance. The end of the hypha in either case has the walls thickened and becomes darker, more reddish in color and tapers to a sharp point. These should by no means be called cystidia as they are distinctly spine-like and not at all of the form of sacs or cysts. It is to be observed that the term cystidium has come to be used very loosely and inaccurately in some late mycological literature and is frequently employed where the term seta should be used.

In 1897, Charles H. Peck founded his genus *Hydnochaete* on *H. setigera* Peck[3] a single species which proves to be identical with *Asterodon ferruginosum* Pat. *Hydnochaete* Peck is, therefore, a typonym of *Asterodon* Pat. The name *Hydnochaete*, however, had been previously used by Bresadola. Aware of this fact and not knowing the relation of Peck's genus to *Asterodon* Pat., Saccardo in 1898 proposed the name *Hydnochaetella*[4] for Peck's

[1] Investigation prosecuted with the aid of a grant from the Esther Herrman Research Fund of the New York Academy of Science.

[2] Pat. Bull. Soc. Myc. 10: 130. *Pl.* 5. 1894.

[3] Peck, Ann. Rep. N. Y. State Mus. 50: 113. 1897.

[4] Sacc. Tab. Com. Gen. Fung. 11. 1898.

genus and published the combination *Hydnochaetella setigera* (Peck) Sacc., making *Hydnochaetella* Sacc. another typonym of *Asterodon* Pat.

In 1896, Bresadola published the genus *Hydnochaete* as a monotypic genus based on *H. badia* Bres.,[5] a species from Brazil, thus antedating Peck in the use of the name. As *Hydnochaete* Bres. is also characterized by the presence of reddish setae, some confusion has arisen in respect to these genera. Bresadola expressly states that his genus *Hydnochaete* is near but distinct from *Asterodon* Pat. He also remarks that he has three forms of the species *H. badia,* the first "perfecte hydnoidea"; the second "raduloidea"; and the third "irpicoidea." Having received from Bresadola by his generous kindness authentic material of his *H. badia,* presumably a part of the original collection, we have had the opportunity of examining the characters of this interesting species.

In respect to substance, development of the hymenophore, and the character of the setae, the species appears to be distinctly congeneric with *Hydnoporia fuscescens* (Schw.) Murrill. It may also be noted that the latter species is quite variable in the development of the hymenial surface and may often be described as hydnoid, or raduloid, or irpicoid, or even polyporoid. Considering the highly variable character of both these species, the question may be raised as to whether they are specifically distinct. We are familiar with the Schweinitzian species, which is abundant in North America, and, while the Bresadolan material is not in sufficient quantity to settle the matter beyond all doubt, we believe they are distinct. *Hydnochaete badia* Bres. has a thicker subiculum and is darker colored, being umbrinous to badious within and gray-brown or fuscous on the hymenial surface, while *Hydnoporia fuscescens* (Schw.) Murrill is more fulvous both within and without.

It may be noted that the setae in *Hydnochaete* Bres. are essentially different from those in *Asterodon* Pat. In the former, there are no branched or stellate forms and the seta is not simply the modified pointed tip of a single hypha. On the contrary, they are much larger than the hyphae and appear to be a distinct morphological structure, but how they originate or what their rela-

[5] Bresadola, Hedwigia **35**: 287. 1896.

tion may be to the hyphae could not be definitely determined, and probably the question could only be answered by tracing out their development in special cultures.

There remains yet to be discussed the correct name of the Schweinitzian species. A plant was described by Schweinitz in 1822 under the name *Sistotrema olivaceum*,[6] which was undoubtedly a pileate form of this same species. A specimen in the Schweinitz herbarium at Philadelphia which has all the characters of this species, including the setae, is there marked "540–31 *Irpex cinnamomeus* Epic. 19. *Hydnum olivaceum* Schw. On decaying brush. Salem." In the commentary on Schwenitz's work by Berkeley and Curtis,[7] this very specimen is commented on as "540 *H. olivaceum* Schwein.!" with the remark that it belonged to *Irpex cinnamomeus*.

In the herbarium of E. Fries at Upsala, is to be found a specimen marked "*Hydn. olivaceum* L. v Schweinitz," a specimen undoubtedly received by Fries from Schweinitz. This has all the characters of the species under discussion, including the setae. This specimen also has a critical note appended to it by Bresadola, "Non differt ab Irpici cinnamomeo & fuscescente."

As to *Irpex cinnamomeus* Fries, nothing that could be regarded as a true type was found at Upsala. However, all the specimens there placed under this name were communicated by Ellis from North America through De Thümen and were clearly our American plant with the characteristic teeth and setae.

There is probably no type specimen of *Sistotrema fuscescens* Schw. in existence, but the forms we are now discussing have been more commonly known to American mycologists under the specific name *fuscescens* either as *Hydnum fuscescens* or as *Irpex fuscescens*. In the Schweinitz Herbarium, there is a specimen marked "580–7 Syn. Fung. I. cinnamomeus Epic. 19. Irpex fuscescens Schw. Beth." which is unquestionably the same species that we are now discussing.

We append the correct names of the species here discussed, with their synonymy. It needs only to be added that *Hydnochaete* Bres. should be placed in the family Polyporaceae as treated by

[6] Schw., Schr. Nat. Ges. Leipzig 1: 101. 1822.
[7] Jour. Acad. Nat. Sci. II. 3: 215–218. 1856.

Murrill in NORTH AMERICAN FLORA, although under the Friesian system it would doubtless be placed in the Hydnaceae as part of the old genus *Irpex*.

ASTERODON FERRUGINOSUM Pat. Bull. Soc. Myc. Fr. **10**: 130. *pl. 5*. 1894.

Hydnochaete setigera Peck, Ann. Rep. N. Y. State Mus. **50**: 113. 1897.

Hydnochaetella setigera Sacc. Tab. Com. Gen. Fung. 11. 1898.

HYDNOCHAETE BADIA Bres. Hedwigia **35**: 287. 1896.

HYDNOCHAETE OLIVACEUM (Schw.)

Sistotrema olivaceum Schw. Schr. Nat. Ges. Leipzig **1**: 101. 1822.

Sistotrema fuscescens Schw. Schr. Nat. Ges. Leipzig **1**: 102. 1822.

Hydnum olivaceum (Schw.) Fries, Elench. Fung. **1**: 134. 1828.

Irpex cinnamomeus Fries, Epicr. Myc. 524. 1838.

Hydnoporia fuscescens (Schw.) Murrill, N. Am. Flora **9**: 3. 1907.

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THE DEVELOPMENT OF THE CARPOPHORES OF CERIOMYCES ZELLERI

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(WITH PLATES 140 AND 141, CONTAINING 12 FIGURES)

A review of the literature shows that very little, if any, critical research has been done on the development of the carpophores of the fleshy pore-bearing hymenomycetes. Among the early writers, DeBary[1] mentions some of these when he divides the carpophores of hymenomycetes into two groups; viz., angiocarpic, or those forms having a marginal veil, and gymnocarpic, those forms "of purely marginal or apical progressive growth" and thus, of course, without a marginal veil. He says that *Boletus luteus* and *B. elegans* have marginal veils, while other species of this and other genera are purely gymnocarpic. Thus, with these few exceptions, he merely assigned Boletus to the gymnocarpic type of the development without a critical study of the genus. A study of the development of a species of Boletus was undertaken because it promised to throw some light upon the types of devlopment of the pileate fungi. Material for this study was collected in the fall of 1912. *Ceriomyces Zelleri* was chosen because it is so very common about Seattle, and because its gregarious habit facilitates the collection of sporophores in the young stages.

The material for the study of this species was collected in a forest of conifers on the campus of the University of Washington. It was in this place that the type specimens[2] were collected. Therefore, the identity of the species is certain.

The young fruiting bodies were found in quantities growing from a yellow mycelium which causes a matting of the conifer needles. Sections of the rhizomorphs which lead to the carpo-

[1] *DeBary, A.:* Comparative Morphology and Biology of the Fungi, Mycetozoa and Bacteria. English Edition. 289–297. 1887.

[2] *Murrill, W. A.:* Pacific Coast Polyporaceae and Boletaceae. MYCOLOGIA 4: 99–100. 1912.

phores show the structure to be a pseudoparenchyma. The hyphae are 3–4 μ in diameter and the cells average 24 μ in length. The rhizomorphs are 50–90 μ in diameter. The yellow carpophores are easily recognized on the surface of this mat of rhizomorphs, and it is almost impossible for one who once knows them to mistake them for other pileate forms. The mature as well as the large immature carpophores were collected from the same mycelium. The only other species of Boletus which is common in this vicinity and might be confused with *C. Zelleri* because of its gregarious habit is *C. communis,* but the writer has never found the latter growing in this place, although the spot is often visited by him.

The material was killed in chromo-acetic acid and stained with fuchsin, using picric acid as a destaining agent. This stain gives the best results of any tried where a concolorous stain is wanted to show differentiation in protoplasmic content. A large number of small carpophores of different sizes were collected. The size of the carpophores does not necessarily correspond with the degree of development, so it is not possible to forecast the stages of growth by the size of the plants. The smallest undifferentiated fruit bodies sectioned were about 1 mm. in diameter, while some of the larger ones were 1.5×3 mm. however, others in which differentiation had begun to show plainly, measured 1×2 mm.

The first stages show no differentiation (Fig. 1). There is no indication of a universal veil, either by differential staining or by the usual coating of loosely woven hyphae. In fact, as the later stages show, there is *no* veil, either universal or partial; the carpophores are thus entirely gymnocarpic and DeBary was correct in his inference that some of the Boleti are gymnocarpic. The young undifferentiated carpophore elongates vertically and becomes three or four times longer than broad. There is no differentiation of tissue during this elongation. The carpophore is still a homogeneous mass of hyphae, their general direction being vertical in the inner part and parallel with the surface in the peripheral portion. The first differentiation begins as a superficial, darkly-staining, annular region extending around the carpophore a short distance from its summit (Fig. 2). This area grows centripetally from the periphery and slightly upward, forming what is geometri-

cally the surface of a truncated cone. This feature is the demarcation of the pileus fundament above and the stipe fundament below. However, before this differentiation is complete, the hyphae above in the pileus fundament begin a radiate growth in the peripheral portion and the palisaded cortex of the pileus is formed. Figure 3 shows this palisade of an older pileus. The ends of the excurrent hyphae are somewhat tufted, and no doubt this feature brings about the characteristic velvety surface of the pileus. This palisade extends over the summit of the carpophore and down over all sides of the pileus fundament to the deeply staining area. The hyphae in this deeply staining portion extend vertically through it. This area resembling a truncated cone becomes a plane of cleavage, and the hyphae break apart here forming a superficial annular furrow. The cleavage takes place throughout the area simultaneously; *i. e.,* it is neither decidedly centripetal nor centrifugal. Figures 4 and 5 show different stages in the cleavage process, and figure 6 is the cleavage plane of figure 5 highly magnified. After the annular furrow is formed, the ends of the hyphae which were cut off above project downward, forming a palisade which is the primordium of the hymenium. The tips of these hyphae become blunt and form a smooth surface which is always free to the exterior after its formation. It is clear, therefore, that the hymenium is exogenous in its origin.

The superficial hyphae of the stipe keep the same general relation to the periphery which they sustained in the undifferentiated carpophore. However, the ends of the hyphae which were cut off below the annular furrow project upward, forming a palisade on the lower surface of the furrow. As the stipe elongates and the furrow broadens, this palisade is carried down to form the cortex of the upper part of the stipe. Thus, the cortex of the lower part of the stipe is composed of hyphae which extend parallel with the surface, while the portion of the cortex of the stipe near the pileus is of palisaded hyphae. Figure 7 shows this feature in the cortex of the stipe. The pileus increases in size by a centrifugal growth at the margin, the hyphae turning upward and downward at this point adding to the palisaded surface and the primordium of the hymenium, respectively. At this stage the hymenium is plane and quite horizontal.

A little later, slight anastomosing elevations of the hymenial primordium appear. These are formed by a differential downward growth of the hyphae in these regions (Fig. 8). As the hyphae forming these elevations grow downward, they turn out horizontally on both sides to form the hymenium in the pores. The hymenium stains deeply while the central part or trama takes comparatively little stain. The trama is a pseudoparenchymous tissue. After it has grown down for some distance, the trama begins to broaden by a diametrical growth of the hyphae, which also become loosely associated. For this last reason, the pores of the mature carpophores can be easily torn apart or separated from the trama of the pileus. The subhymenium appears later, made up of an interwoven mass of hyphae tightly crowded together. The number of basidia is increased by the branching of the hyphae at the clamp connections in the subhymenium. The hymenium lines the pores only. The mouths of the pores are sterile. Figures 9 and 10 show vertical and transverse sections of the pores, respectively.

To sum up the development of the carpophore of *Ceriomyces Zelleri* Murrill, there is a homogenous mass of tissue which is differentiated simultaneously into pileus and stipe by a cleavage plane which gives rise to an annular furrow. The hymenium is formed in the roof of this furrow and is exogenous in its origin. *Ceriomyces Zelleri* is gymnocarpic because there is no marginal veil.

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EXPLANATION OF PLATES CXL AND CXLI

Photomicrographs by Homer O. Blair

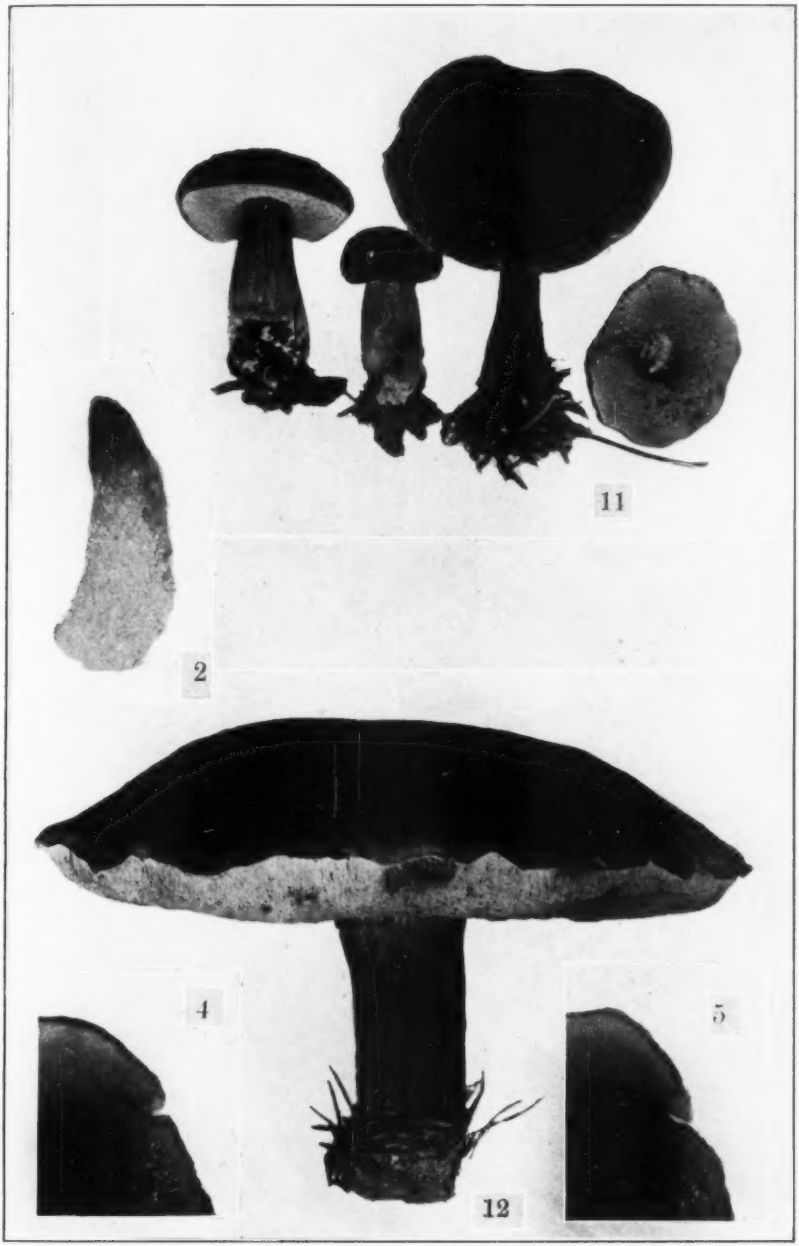
Figure 1. A small undifferentiated carpophore of *Ceriomyces Zelleri*. × 30.

Figure 2. The first differentiation in the carpophore, showing deeply staining ring in the periphery. × 20.

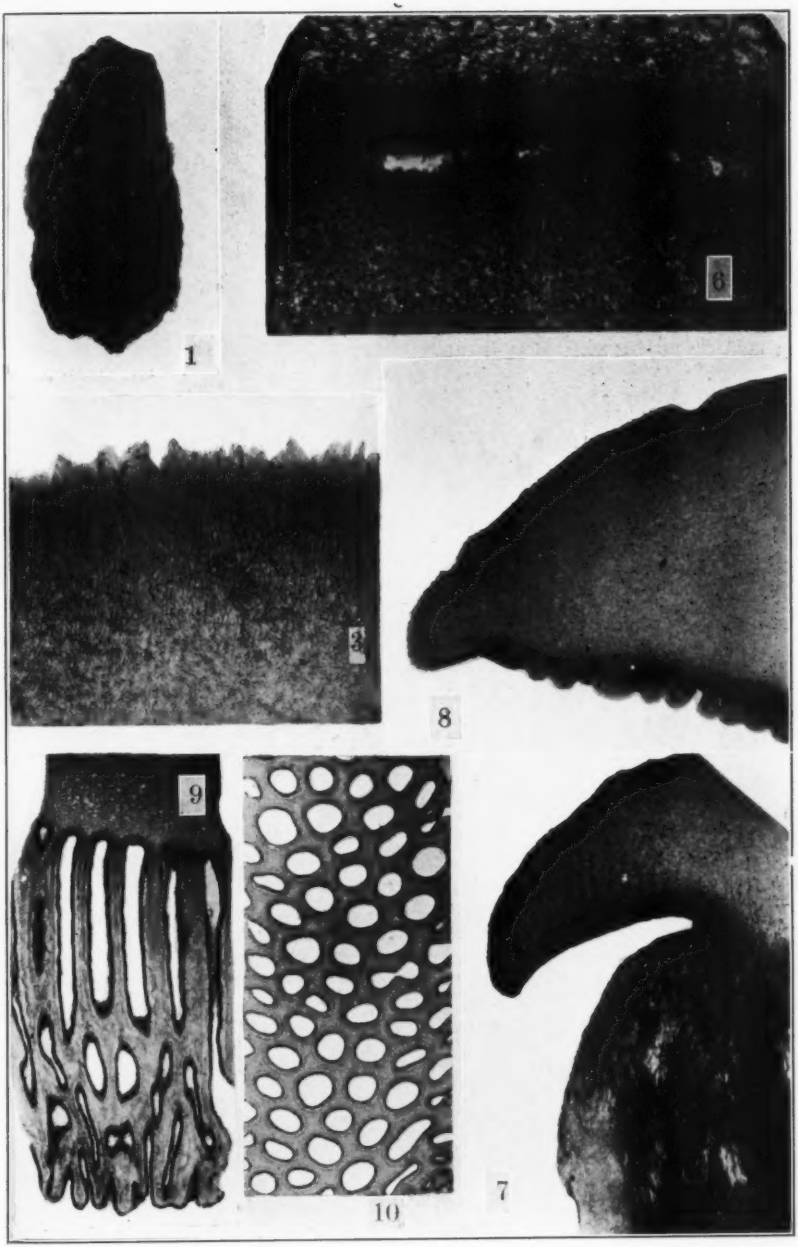
Figure 3. A portion of the palisaded cortex of an older pileus with the excurrent hyphæ tufted. × 250.

Figures 4, 5. The cleavage plane in different stages of cleavage. × 12.5.

Figure 6. A portion of the cleavage plane shown in figure 5 much enlarged. × 250.



CERIOMYCES ZELLERI MURRILL



CERIOMYCES ZELLERI MURRILL

Figure 7. A portion of a vertical section through the stipe. The junction of the palisaded cortex of the upper portion of the stipe and the portion of the cortex where the hyphæ are parallel with the surface is shown. × 25.

Figure 8. The first folding of the hymenial primordium. × 40.

Figure 9. A longitudinal section of the pores showing the trama, subhymenium, and hymenium. × 30.

Figure 10. A cross section of the pores. × 30.

Figure 11. A group of nearly mature carpophores. × 1.

Figure 12. A mature carpophore of *Ceriomyces Zelleri*. × 1.

THE SMUTS AND RUSTS OF UTAH—II[1]

A. O. Garrett

The following paper includes all of the work done since 1910, but the bulk of it embraces the results of an expedition to Grand and San Juan counties with Dr. Rydberg, of the New York Botanical Garden, during the summer of 1911. The southern part of Utah is practically a new field for the mycologist, and on this expedition several species were found not before reported from Utah. As a result, the western extension of these species was increased by several hundred miles.

The list of smuts and rusts given in the first paper was limited to those that had been collected by the writer. In the present paper are listed not only those collected by the writer and Dr. Rydberg on the southern trip, but all others referred to Utah in the available literature of the subject. Where the given species has not been collected by the writer, the name of the collector is clearly indicated in the text.

Acknowledgments for determinations of hosts and fungi are due to the same gentlemen who so kindly assisted the writer in the preparation of his first paper. Dr. Arthur has read over the manuscript, and to him the writer's thanks are especially due.

The species marked with an asterisk are not included in the list previously published.

USTILAGINALES

3. Sorosporium Saponariae Rud.

In inflorescence of *Stellaria Curtisii* (Rydb.): *2155*, July 8, 1911, La Sal Mts. near Gold Basin, San Juan Co.: alt. about 2,970 m.

[1] The first paper on "The Smuts and Rusts of Utah" was published in Mycologia 2: 265–304, November, 1910.

22. UROCYSTIS ANEMONES (Pers.) Wint.

In leaves and stems of *Trautvetteria grandis* Nutt.: *2238*, August 17, 1911, Abajo Mts., San Juan Co.; alt. about 3,394 m.

27.* USTILAGO HIERONYMI Schröt. P. Henn. Hedwigia **35**: 213. 1896.

In leaves of *Bouteloua oligostachya* (Nutt.) Torr.: *2233*, Aug. 14, 1911, Montezuma Canyon, near Monticello, San Juan Co.; alt. about 2,080 m.

28.* ENTYLOMA ARNICALE Ellis & Ev.

Bull. Torrey Club **22**: 57. 1895.

In leaves of *Aster sp.*: *830*, August 12, 1905, Big Cottonwood Canyon, near Brighton.

29.* ENTYLOMA CRASTOPHILUM Sacc. Michelia **1**: 540. 1879.

On unknown grass: *832a*, Aug. 12, 1905, Big Cottonwood Canyon.

UREDINALES

4. AECIDIUM MONOICUM Peck.

On *Arabis retrofracta* Graham: *2151*, July 7, 1911, Gold Basin, La Sal Mts., San Juan Co. Dr. Arthur has proved by cultures[2] that the form of *Aecidium monoicum* on the *Arabis* hosts is connected with *Puccinia triseti* Erik. on *Trisetum subspicatum*, and has united the two under the name of *Puccinia monoica* (Peck) Arthur. In my previous paper, I included an *Aecidium* on *Sophia* sp. as a form of *Aecidium monoicum*. This *Aecidium* differed strikingly, however, from the specimens taken on the *Arabis* hosts. The form on *Sophia* (my number *733*) had bright orange peridia that are conspicuously long; while on the *Arabis* hosts they are pale yellow and not so long. According to Dr. Arthur, the collection on *Sophia* is the aecial stage of *Puccinia subnitens* Dietel. The collection was made however at an altitude of about 2,610 meters and in a spruce-fir association, neither of which conditions point to the probable presence of *Distichlis*.

[2] MYCOLOGIA 4: 61. 1912.

7. PUCCINIA ALTERNANS Arthur

The above is given as the correct name of the rust reported in the writer's first list as *Aecidium* sp., No. 7. Dr. Arthur (Mycologia 1: 249. 1909) connects this with No. *1137* of the writer's collection on *Bromus Porteri* (included in No. 93 of "Smuts and Rusts of Utah" as a specimen of *Puccinia rubigo-vera*).

9. GYMNOSPORANGIUM NELSONI Arth.

On *Juniperus scopulorum* Sarg.: *2133a*, August 19, 1910, Mill D Flat, Big Cottonwood Canyon. These were old galls which had undoubtedly infected a small *Amelanchier* bush growing in the same clump with the Juniper, and bearing abundant aecia on its leaves.

The galls have also been collected on the same host by Professor C. P. Smith in Cache Co. (April 1910). Indeed, this is the commonest and most widely spread *Gymnosporangium* in Utah. Recently it has been found that the rust formerly called *Gymnosporangium durum* is the telial form of *G. Nelsoni*.

11. MELAMPSORA BIGELOWII Thüm. II.

On *Salix glaucops* Anders.: *2263*, August, 1911, San Juan Co. On *Salix monticola* Bebb?: *2187*, July 26, 1911, Monticello, San Juan Co. On *Salix pachnophora* Rydb.: *2250*, August 19, 1911, Spring Creek, Abajo Mts., San Juan Co.; 2,765 m.

15. MELAMSPORELLA ELATINA (Alb. & Schw.) Arth. II.

On *Cerastium scopulorum* Greene: *2249*, August 19, 1911, Abajo Mts. near West Mountain, San Juan Co., alt. about 3,030 m. On *Cerastium Behringianum* Regel: *2174*, July 15, 1911, Gold Basin, La Sal Mts., San Juan Co.; alt. about 3,272 m.

The aecial stage of this rust is *Peridermium elatinum* Schw. & Kze., of which collections in Utah are recorded by Arthur & Kern in Bulletin Torrey Botanical Club 33: 435. 1906 as follows: Collected by Marcus E. Jones, Aug. 6, 1905, Black Mountain, Manti; by Pammel & Stanton (No. 642), July 27, 1900, Brush Creek, 9,000 ft.; by Rydberg & Carleton (No. *7642*), August 5, 1905, Aquarius Plateau.

21. PHRAGMIDIUM MONTIVAGUM Arth.

On *Rosa neomexicana*: *2180*, July 24, 1911, Monticello, San Juan Co. On *Rosa aciculata* (Cockerell) Rydb.: *2166*, July 12, 1911, La Sal Mts., San Juan Co. On *Rosa* sp. nov.: *2217*, III, August 8, 1911, Scorup's pasture, Elk Mts., San Juan Co.

25. PUCCINIA CLEMATIDIS (DC) Lagerh. (*P. Agropyri* Ellis & Ev.)

On *Agropyron Palmeri* (S. & S.) Rydb.: *2184*, July 24, 1911, Monticello, San Juan Co. These plants were surrounded by an abundance of *Clematis ligusticifolia* heavily infected with the aecia. On *Agropyron tenerum* Vasey: *2204*, August 4, 1911, White Canyon, San Juan Co. Again in this collection there was an abundance of heavily-infected *Clematis* plants surrounding the *Agropyron*.

34. PUCCINIA CINEREA Arth.

On *Poa Wheeleri* Vasey: *2213*, Jack Spring, San Juan Co., July 30, 1911.

35. PUCCINIA CIRSII Lasch.

On *Carduus pulchellus* Greene: *2207*, August 8, 1911, White Canyon, San Juan Co. On *Cirsium oreophilum* Rydb.: *2168*, July 12, 1911, La Sal Mts., San Juan Co. On *Carduus oblanceolatus* Rydb.: *2168a*, July 12, 1911, La Sal Mts., San Juan Co. On *Cirsium Tracyi* Rydb.: *2186*, July 24, 1911, Monticello, San Juan Co. On *Carduus americanus* (A. Gray) Greene: *2171*, July 15, 1911, La Sal Mts., San Juan Co.

42. PUCCINIA CREPIDIS-ACUMINATAE Syd.

On *Crepis intermedia* A. Gray: *2208*, July 31, 1911, Elk Mts. near Bears' Ears.

44. PUCCINIA CURTIPES Howe

On *Saxifraga debilis* Engelm.: *2240*, August 18, 1911, Abajo Mts., San Juan Co.; alt. about 3,545 m.

45. PUCCINIA DOUGLASII Ellis & Ev.

On *Gilia pungens* (Torr.) Benth.: *2257*, August 24, 1911, Stage Station, Head Dry Valley, San Juan Co.; alt. 1,893 m.

47. PUCCINIA EFFUSA Dietel & Holw. I.

On *Viola adunca* Smith: *2154*, July 8, 1911, La Sal Mts. near Gold Basin, San Juan Co.

56. PUCCINIA GUTIERREZIAE Ellis & Ev. III.

On *Gutierrezia filifolia* Greene: *2188*, July 28, 1911, near Monticello, San Juan Co., alt. about 2,091 m.

58. PUCCINIA HELIANTHELLAE (Peck) Arth. II.

On *Helianthella arizonica*?: *2153*, July 7, 1911, La Sal Mts., near Gold Basin, San Juan Co.

64. PUCCINIA HOLBOELLII Hornem. III.

On *Draba Helleriana* Greene: *2158a*, July 9, 1911, Gold Basin, La Sal Mts., San Juan Co. On *Draba spectabilis* Greene: *2176*, July 17, 1911, Gold Basin, La Sal Mts., San Juan Co.

76. PUCCINIA MENTHAE Pers.

On *Mentha Penardi* (Briq.) Rydb.: *2229*, II, Aug. 14, 1911, Monticello, San Juan Co., alt. about 2,129 m. On *Monarda menthaefolia* Benth.: *2230*, August 18, 1911, Montezuma Canyon near Monticello, San Juan Co.

79. PUCCINIA MONTANENSIS Ellis. II.

On *Sitanion rigidum* J. G. Smith: *2205*, August 5, 1911, Armstrong Canyon above Edwin Natural Bridge, San Juan Co.

88. PUCCINIA POARUM Niessl. II.

On *Poa crocata* Mich.: *2241*, August 17, 1911, Abajo Mts., San Juan Co., alt. about 3,450 m. On *Alopecurus aristulatus* Michx.: *2185*, July 24, 1911, near Monticello, San Juan Co. On *Poa longipedunculata* Scribn.?: *2260*, August, 1911, San Juan Co.

96. PUCCINIA SHERARDIANA Körn.

On *Sphaeralcea marginale* York: *2195*, July 29, 1911, Allen Canyon, Elk Mts., San Juan Co. On *Sphaeralcea arizonica* Heller: *2222a*, Aug. 9, 1911, mouth of Dry Wash, San Juan Co. On *Malvastrum dissectum* (Nutt.) A. Nels.: *2181*, July 24, 1911, near Monticello, San Juan Co.: alt. about 2,121 m.

101. PUCCINIA STIPAE Arth.

On *Stipa comata* Trin. & Rupr.: *2203*, August 4, 1911, White Canyon, San Juan Co.

105. PUCCINIA SUBNITENS Dietel

On *Sarcobatus vermiculatus* (Hook.) Torr. Collected by Professor Marcus E. Jones on this host at Burbank, Utah, (alt. about 1800 m.), June 26, 1906. (M. E. Jones No. *7809*). Dr. Arthur has shown by cultures the relation of this *Aecidium* (*Aecidium Sarcobati* Peck) to *Puccinia subnitens.*

Since the publication of my last paper, culture work has also shown the connection between the *Aecidium* on *Atriplex hastata* and this *Puccinia.* (For reference to a collection of the aecial stage on *Sophia,* see No. 4 of this paper.)

109. PUCCINIA VIOLAE (Schum.) DC. I, III.

On *Viola canadensis* L.: *2245*, August 18, 1911, Abajo Mts., San Juan Co.

129. UROMYCES ASTRAGALI (Opiz.) Schröt. II.

On *Astragalus microlobus* A. Gray: *2237a*, August 11, 1911, Montezuma Canyon near Monticello, San Juan Co. On *Astragalus atratus arctus* Sheldon: *2146*. July 1, 1911, Moab, Grand Co. On *Astragalus argophyllus* Nutt.: *2089*, Aug. 26, 1909, Gogorza, Summit Co.

131. UROMYCES INTRICATUS Cooke. (*U. Eriogoni* Ell. & Hark.)

On *Eriogonum croceum* Small: *2198*, II, July 31, 1911, San Juan Co.

132. UROMYCES PROEMINENS Pas. (*U. Euphorbiae* C. & Pk.)

On *Euphorbia Fendleri* T. & G.: *2211*, August 6, 1911, White Canyon, Natural Bridge National Park, San Juan Co.

140. UROMYCES PLUMBARIUS Peck.

On *Oenothera montana* Nutt. (*Pachylophus montanus* (Nutt.) A. Nelson): *2177*, July 19, 1911, La Sal Mts., Grand Co.

145.* AECIDIUM CREPIDICOLA E. & G. Jour. Myc. **6**: 31. 1890

On *Crepis glauca* (Nutt.) T. & G. Given by A. G. Johnson as occurring in Utah in his paper "The Unattached Aecial Forms of Plant Rusts in North America" (No. 88, page 406).

146.* AECIDIUM OCCIDENTALE Arth. Bulletin Torrey Bot. Club **31**: 7. 1904

On *Clematis Douglasii* Jones: I, collected by Mrs. Mary Strong Clemens, August 1, 1911, at Holiday Park, Uinta Mts.

147.* AECIDIUM sp.

On leaf of *Lappula caerulescens* Rydb. A single leaf affected by a very immature aecidium was collected by one of the writer's pupils in May, 1913. This was sent to Dr. Arthur for examination. He replied that sectioning had shown pycnia at least, and that no aecium was known on this host.

148.* COLEOSPORIUM RIBICOLA (C. & E.) Arth. (*Uredo Jonesii* Peck). N. A. Flora **7**: 86. 1907

On *Ribes inebrians* Lindl.: *2200*, August 2, 1911, Bears' Ears, Elk Mts., San Juan Co. Alt. about 2,583 m. *2253*. August 14, 1911, Montezuma Canyon near Monticello, San Juan Co. On *Ribes coloradense* Coville: *2252*. August 20, 1911, Innes' sawmill, Abajo Mts., San Juan Co., alt. about 2818 m.

149.* CRONARTIUM COLEOSPORIOIDES (Dietel & Holw.) Arth. N. A. Flora **7**: 123. 1907

On *Castilleja linariaefolia* Benth.: *2236*, August 14, 1911, Montezuma Canyon near Monticello, San Juan Co. Alt. about 2,076 m.

150.* CRONARTIUM COMANDRAE Peck, Bot. Gaz. **4**: 128. 1879

On *Comandra pallida* A. DC. Collected by Mrs. Clemens Aug. 14, 1911, at Holiday Park, Uinta Mts.

151.* GYMNOSPORANGIUM CLAVARIAEFORME (Jacq.) DC. I. Fl. Franc. **2**: 217. 1805

On *Amelanchier nana* Nutt.: *2247*, I. (*Roestelia lacerata* (Sow.) Fr.) August 19, 1911, Abajo Mts. near West Mountain, San Juan Co., alt. about 3,030 m. This is the first recorded collection of this species in the state.

152.* GYMNOSPORANGIUM GRACILENS (Peck) Kern & Bethel, I, Bull. N. Y. Bot. Garden **7**: 458. 1911

On *Philadelphus occidentalis* A. Nels.: *2227*, I. (*Aecidium gracilens* Peck). August 11, 1911, Dry Wash south of Abajo Mts., San Juan Co.; alt. about 2,348 m. The neighboring trees of *Juniperus monosperma* were abundantly affected with the galls of a defunct *Gymnosporangium*. The peridia of the aecia of this species are bright orange-yellow when first collected, but fade rapidly upon drying. This is the first record of the occurrence of the aecial stage of this species in the state. A record of the collection of the telia on *Juniperus utahensis* (Engelm.) Lemmon in Utah is given in N. A. Flora **7**: 201. 1912.

153.* GYMNOSPORANGIUM INCONSPICUUM Kern, I, Bull. Torrey Bot. Club **34**: 461. 1907

On fruit of *Amelanchier alnifolia* Nutt.: *2225*, August 11, 1911, Dry Wash near Abajo Mts., San Juan Co., alt. about 2,136 m. Several trees of fairly good size bore a profusion of fruit, and scarcely a single fruit had escaped infection. The material was in fine condition. Professor Charles P. Smith also collected very fine material of this in Dry Canyon, Cache County, on the same host, Aug. 8, 1909. Still another collection in my herbarium is that made by Mrs. Mary Strong Clemens, August 15, 1911, at the mouth of the Weber river.

On fruit of *Amelanchier utahensis* Koehne: *2226*, August 11, 1911, head of Dry Wash, near Abajo Mts., San Juan Co. Not so

abundant as on *Amelanchier alnifolia,* nor apparently so perfectly developed.

This aecidium was described by Kern as *Roestelia Harknessianoides.*

154.* MELAMPSORA ALBERTENSIS Arth. II, Bull. Torrey Bot. Club **33**: 517. 1906

On leaves of *Populus tremuloides* Michx.: *2248,* August 19, 1911, Abajo Mts. near West Mountain, San Juan Co., alt. about 3,030 m. Dr. Arthur has confirmed by cultures that this rust has its aecia on *Pseudotsuga mucronata* (Arthur; Cultures of Uredineae in 1911—Mycol. **4**: 58. 1912).

155.* PHRAGMIDIUM OCCIDENTALE Arth.; Earle, in Greene, Pl. Baker. **2**: 3. 1901

On *Rubus parviflorus* Nutt.: *2246,* August 18, 1911, Abajo Mts. below Innes' sawmill. Alt. about 2,788 m. This rust has also been collected in Emigration Canyon, Salt Lake County.

156.* PUCCINIA ACROPHILA Peck Bot. Gaz. **6**: 227. 1881

On *Synthyris laciniata* (A. Gray) Rydb.: *2136,* August 24, 1910, mountains above Lake Blanche, Big Cottonwood Canyon, Salt Lake County.

Mrs. Mary Strong Clemens collected the same species of rust on *Synthyris pinnatifida* Wats. at Mt. Minnie, Little Cottonwood Canyon, Salt Lake County, on August 16, 1911. The type was collected in Utah on the last-named host by Professor Marcus E. Jones.

157.* PUCCINIA ACTINELLAE (Webb) Syd. Monogr. Ured. **1**: 4. 1904

On *Tetraneuris leptoclada* (A. Gray) Greene: *2201,* Aug. 3, 1911, rim-rock above Armstrong Canyon near Edwin Natural Bridge, San Juan County; alt. about 1,788 m.

158.* PUCCINIA ADOXAE DC. Flore Franc. **2**: 220. 1805

On leaves and stems of *Adoxa Moschatellina* L.: *2239,* August 17, 1911, Abajo Mts., San Juan Co., at about 3,333 m. alt.

159.* PUCCINIA ALBULENSIS Magn. III, Ber. Deutsch. Bot Ges. **8**: 169. 1890

On *Veronica Wormskjoldii* R. & S. (*V. alpina* Amer. Auct.): *736*, July 10, 1905, Alta Valley, head of Little Cottonwood Canyon, Salt Lake Co., at about 2,878 m. *855*, August 23, 1905, Big Cottonwood Canyon, 2,650 m. Not very common. Exsic. Fungi Utahenses *94*.

160.* PUCCINIA CIRCAEAE Pers. Roemer, Neues, Mag. **1**: 119. 1794

On *Circaea pacifica* Aschers & Magnus: *2131*, August 19, 1910, Mill D, south fork Big Cottonwood Canyon, Salt Lake County.

161.* **Puccinia Clementis** Garrett, sp. nov. III.

III. Telia amphigenous (or rarely on stem or silique), not very numerous, scattered or occasionally confluent; roundish or elliptical, 1–5 mm. across; pulvinate; umber-brown; rather tardily naked, the ruptured epidermis plumbeous, usually easily discernible; teliospores 32–39 × 15–19 μ; the upper cell umbonate at the apex, the umbo as much as 2.6 μ long. Spores granular, and indistinctly striate, but slightly constricted at the septum.

Collected by Mrs. Mary Strong Clemens, Bald Mountain, Uinta Mts., on *Parrya platycarpa* Rydb., August 10, 1911.

162.* PUCCINIA COMMUTATA Syd. I, Monogr. Ured. **1**: 201. 1904

On *Valeriana occidentalis* Heller. I (*Aecidium Valerianearum* Duby) was collected by Mrs. Mary Strong Clemens at Pharaoh's Glen, Parley's Canyon, August 4, 1911. The material was in especially good condition.

163.* PUCCINIA GLOBOSIPES Peck Bull. Torrey Bot. Club **12**: 34. 1885

On *Lycium Andersoni* A. Gray. Collected by Professor Marcus E. Jones at Le Verkin, 909 m. altitude, and reported in his "Contributions to Western Botany" No. 7, page 730, 1895. I have not seen the specimens.

164.* PUCCINIA GRINDELIAE Peck Bot. Gaz. **4**: 127. 1879

On *Chrysopsis Bakeri* Greene: *2223*, August 9, 1911, Dry Wash, San Juan Co.; alt. about 1,818 m.

165.* PUCCINIA GROSSULARIAE (Schum.) Lagerh. III, Ured. Herb. Fr. **60**: 1895

On *Carex* sp.: *2221*, Aug. 8, 1911, near Kaigalia pasture, Elk Mts., San Juan Co.

166.* PUCCINIA KOELERIAE Arth. Mycologia **1**: 247. 1909

On *Koeleria gracilis* Pers.: *2231*, Aug. 14, 1911, Montezuma Canyon near Monticello, San Juan Co., alt. about 2,076 m. In the original description of this rust, *Berberis aquifolius* is given as the host of its aecial stage.

167.* PUCCINIA MUHLENBERGIAE A. & H. Bull. Lab. Nat. Hist. State Univ. Iowa **5**: 317. 1902

On *Muhlenbergia gracilis* H.B.K.: *2228*, August 11, 1911, head Dry Wash, near Abajo Mts., San Juan Co. On *Muhlenbergia Richardsonii* (Trin.) Rydb.: *2232*, August 14, 1911, Montezuma Canyon near Monticello, San Juan Co., alt. about 2,076 m. The aecium of this species is said to be found on *Callirrhoe involucrata* (Muhlenbergia, Jan. 1912, page 31).

168.* PUCCINIA OBLITERATA Arth. I, Mycologia **1**: 250. 1909

On *Aquilegia caerulea* James: *2160*, July 11, 1911, head of Gold Basin, La Sal Mts., San Juan Co., alt. about 3,242 m. (In the original description of this rust, *Agropyron biflorum* and *A. caninum* are given as the hosts for the telial stage.)

169.* PUCCINIA PENTSTEMONTIS Peck, I, II, III, Bull. Torrey Bot. Club **12**: 35. 1885

"On *Pentstemon confertus* var. *caeruleo-purpureus* Gray" (= *P. procerus* Dougl.) Collected by Marcus E. Jones, at Panguitch Lake, 2,520 m. alt.

170.* PUCCINIA PSEUDOCYMOPTERIDIS Holw. I, III, N. A. Uredineae 1[4]: 91. 1913

On *Pseudocymopterus montanus* (A. Gray) C. & R.: *2161*, I, July 12, 1911, near Gold Basin, La Sal Mts., San Juan Co. *2244*, I, III, Aug. 18, 1911, Abajo Mts. below Innes' sawmill. On *Pseudocymopterus Tidestromii* C. & R.: *2150*, July 5, 1911, La Sal Mts., San Juan Co. near Gold Basin.

171.* **Puccinia Rydbergii** Garrett, sp. nov. III.

Telia small, amphigenous, chestnut-brown, tardily pulverulent, surrounded by the ruptured plumbeous epidermis, often confluent. Teliospores cinnamon-brown, elliptical, rounded at both ends, 26–32 × 16–18 μ; germ-pore at apex of upper cell and near the base of the lower cell; pedicels hyaline, fragile.

On *Sedum stenopetalum* Pursh: *2152*, July 7, 1911, mountains above Gold Basin, La Sal Mts., San Juan Co.; alt. about 3,390 m. Collected by Rydberg & Garrett.

This species differs from *Puccinia Rhodiolae* B. & Br. mainly in the uniformly smaller spores.

172.* PUCCINIA SIEVERSIAE Arth. Bull. Torrey Bot. Club 31: 3. 1904

On *Sieversia turbinata* (Rydb.) Greene. Collected by L. N. Goodding (No. 1377), at Fish Lake, July 17, 1902.

173.* **Puccinia tardissima** Garrett, sp. nov. II, III.

II. Uredosori amphigenous, elongated, dull cinnamon-brown; uredospores spherical to elliptical, verrucose, yellowish-brown, 17–21 × 21–23 μ; germ-pores 4, scattered.

III. Telia like the uredosori, but darker; very rarely met with, the teliospores usually occurring mixed with the uredospores. Teliospores dark-brown, elliptical, 21–24 × 25–35 μ; their walls thin.

On *Arenaria* sp.: *2116*, Oct. 9, 1909, mountain-side south of Wasatch Resort, Little Cottonwood Canyon, Wasatch Mts. Type.

Also collected by E. Bethel in II only on *Arenaria subcongesta* (Wats.) Rydb., Aug. 23, 1907, at Ouray, Colo., and by E. T. & E. Bartholemew on *Arenaria congesta* Nutt., Aug. 30, 1913 (No.

5232), Yellowstone Park, Wyo. This latter collection shows the teliospores as sparse as in the collection made in Utah in October.

This species has been confused with *Puccinia modica* Holw., from which it differs especially in the very thin walls of the teliospores and in their sparse production.

174.* PUCCINIA TUMIDIPES Peck, Bull. Torrey Bot. Club **12**: 34. 1885

On *Lycium pallidum* Miers.: *2196*, July 31, 1911, Hammond Canyon, Elk Mts., San Juan Co., alt. about 1,434 m.

175.* PUCCINIA TURRITA Arth. Bull. Torrey Bot. Club **29**: 230. 1902

On *Saxifraga austro-montana* Wiegand: *2173*, July 15, 1911, La Sal Mts., San Juan Co., alt. about 3,272 m.

176.* PUCCINIA VARIOLANS Hark. Bull. Cal. Acad. Sci., p. 15, 1884

Mentioned in Arthur & Holway's Descriptions of American Uredineae, I, page 56, as having been collected in Utah on *Aplopappus spinosus* DC.

177.* UREDO CASTILLEIAE T. & E. Proc. Calif. Acad. **5**: 731. 1895

On *Castilleja affinis* H. & A. Collected by Professor Marcus E. Jones, July 19, 1894, Capitol Wash, alt. 1,500 m.

178.* UROMYCES AEMULUS Arth. Bull. Torrey Bot. Club **38**: 373. 1911

On *Allium acuminatum* Hook: *363*, June 3, 1904, Farmington Canyon, Davis Co., 1,700 m. alt. This species was found mixed with *Puccinia Blaisdalei* H. & A. in the collection reported in No. 80 of the writer's previous list. Dr. Arthur called attention to it in Mycologia **2**: 290. 1910.

179.* UROMYCES LYCHNIDIS T. & E. I, II, III, Proc. Calif. Acad. **5**: 729. 1895

On *Lychnis Drummondii* (Hook.) Wats. Collected by Professor Marcus E. Jones, August 22, near Tate Mine above Marysvale.

180.* UROMYCES MYSTICUS Arth. Bull. Torrey Bot. Club **38**: 377. 1911

On *Hordeum jubatum* L. Collected by S. M. Tracy (No. 712) at Provo. Date not given (according to Dr. Arthur, as stated in the original description).

181.* UROMYCES OBLONGUS Vize. I, III. Grevillea **5**: 110. 1877

On *Trifolium Parryi* A. Gray: *2172a*, July 15, 1911, La Sal Mts., San Juan Co., alt. about 3,242 m. On *Trifolium scariosum* A. Nelson; *2172*, July 15, 1911, La Sal Mts., San Juan Co., alt. about 3,242 m., July 15, 1911.

182.* UROMYCES PSORALEAE Peck I, III, Bot. Gaz. **6**: 239. 1881

On *Psoralea micrantha* A. Gray: *2144*, July 1, 1911, Moab, Grand Co., 1,212 m.

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HIGH SCHOOL,
SALT LAKE CITY, UTAH

ON A SMALL COLLECTION OF LICHENS FROM JAMAICA, WEST INDIES

R. Heber Howe, Jr.

In April, 1909, at the request of Dr. Duncan S. Johnson, of Johns Hopkins University, the New York Botanical Garden forwarded to me a small collection of lichens collected by him on the island of Jamaica in 1903 and 1906.

At the time I worked over and prepared this list, I was unable to find any recently published list[1] of the lichen flora of Jamaica, but the publication of Dr. L. W. Riddle's list[2] has led me to publish this enumeration. For the advantage of comparison, this list follows Dr. Riddle's arrangement.

Two specimens of the genus *Cladonia* were sent to Prof. Bruce Fink for determination: and the crustose species to Dr. H. E. Hasse; the genus *Stereocaulon* was sent to Dr. Riddle who has also determined several other specimens. Acknowledgment is here most gratefully made.

Pyrenocarpeae

Pyrenula "Lichen No. 7. Goat Isd. IV–16–06." A composite specimen.

Pyrenula "no spores"; *Porina* sp. (?). Spores "28×8 μ."

Anthracothecium Mass. "Lichen No. 4. Goat Isd. IV–16–06." One specimen spores "muriform, pale-brown," Determined by Dr. Hasse. Nos. 1, 6, 8, 11, 31, 32, 37, and 100 and labelled "Lichens" belong in other groups.

Coniocarpineae

Sphaerophorus compressus Ach. "Lichen No. 36. Sir John, V–1–06." One specimen determined by Prof. Fink.

1 Swartz, Prod. 1788 and Flora Indiae Occidentalis, 1806.

2 Riddle, Mycologia, 4: 125–140. 1912.

GRAPHIDINEAE

Arthonia distendens Nyl. "Lichen No. 9 Goat Isd. (near Old Harbor), IV–16–06." The bark of this specimen supports several species, beside the above. Spores "40–60 × 24 μ, oblong and ovoid-oblong, colorless becoming light brown, 6–8 septate (7–9 locular) with several septations in longitudinal axis. Determined by Dr. Hasse. Other species present *Arthonia radiata* (Per.) Th. Fr. "no spores"; *Microglaena* "spores narrowly ellipsoid 23–32 × 10–14,4–7 μ septate and submuriform, decolorate becoming light brown"; *Microthelia* (?) *thelena* (Ach.) Mull. Arg. Spores "oblong-ellipsoid, 15–18 × 5–6 μ; *Thelotrema* (?) *lepadinum* Tuck. Spores "24–52 × 7–16 μ." Determined by Dr. *Graphis* "Lichens No. 5. John Crow Peak, IV–18–03." One specimen, "section *Diplographis,* but no spores seen." Determined by Dr. Hasse.

Chiodecton rubrocinctum Nyl. (= *Ch. sanguineum* (Sw.) Wain.) "Lichen No. 18. Clydesdale, IV–28–06." One specimen determined by Dr. Hasse.

Thelotrema (?) *subtile* Tuck., Determined by Dr. Hasse.

CYCLOCARPINEAE

Ocellularia alba (Feé) Müll. Arg. One specimen determined by Dr. Hasse. Spores "colorless roundish and ovoid-oblong, 3–4 septate."

Bacomyces absolutus Tuck. "Lichen No. 16, near Vinegar Hill (Trees), IV–23–03" and "Lichen 48 on *Eucalyptus* Whitfield Hall Wks. IV–22–03." Two specimens determined by Dr. Hasse No. 48 "contains a *Porina* also."

Cladonia rangiformis Hoffm. "Lichen No. 33, Cladonia sp.? Cinchona Hill, V–2–06." One specimen, determined by Prof. Bruce Fink.

Cladonia rangiformis var. *cubana* Wain. "Lichen No. 45, Blue Mt. Peak, IV–20–03, *Cladonia* sp." One specimen determined by Prof. Fink.

Cladonia didyma var. *rugifera* Wain. "Lichen No. 43, *Cladonia* sp. Clyde Valley, V–8–06." One specimen determined by Prof. Fink.

Cladonia aggregata (Sw.) Ach. "Lichen 34, *Cladonia* sp.? Cinchona Hill, V–20–06." One specimen determined by Prof. Fink.

Cladonia squamosa var. *phyllocoma* Rabenh. "Lichen 44, *Cladonia* sp. Clyde Valley, V–8–06." One specimen determined by Prof. Fink.

Stercocaulon ramulosum (Sw.) Ach. "Lichen No. 13, *Cladonia*, sp. Rd. to Morce's Gap (?)." Specimen determined by Dr. Riddle, of which a part is now in his herbarium.

Stereocaulon cornutum Müll. Arg. "Lichen No. 14, Morce's Gap, 03." One specimen determined by Dr. Riddle.

Leptogium tremelloides (L.f.) Gray. "Lichens No. 2, New Haven Gap, IV–30–03," and "Lichen No. 30, Sir John, V–1–06." Two specimens. Spores 28–32 × 14 μ. Determined by Dr. Riddle.

Leptogium phyllocarpum (Pers.) Nyl. "Lichen No. 19," and "20. Cinchona Hill, IV–28–03." Two specimens. Spores 28–40 × 10–18 μ. Verified by Dr. Riddle.

Leptogium "Lichen No. 3, Morce's Gap, IV–23–03." One sterile fragment is perhaps referable to some form of *chloromelum* (Sw.) Nyl.

Pannaria (*Parmeliella*) *pannosa* (Sw.) Delis. "Lichen No. 38, Portland Gap, IV–16–06," and "Lichen No. 39, Cinchona Hill, IV–28–03." Two sterile specimens. Dr. Riddle refers a part of this material to *P. Mariana* var *isideoidea* Müll. Arg.; a part to *P. rubiginosa* (Thurb.) Del., but in the absence of apothecia it is thought best to refer both to *Pannaria pannosa*.

Coccocarpia pellita (Ach.) Müll. Arg. "Lichen No. 10, Cinchona Hill, IV–25–06 (on soil)." One specimen spores 8 × 16 μ. Verified by Dr. Riddle.

Sticta Weigelli (Ach.) Wain. "Lichen No. 27, Cinchona Hill, IV–03." Determined by Dr. Riddle.

Sticta damaecornis (Sw.) Ach. Nos. 15, 17, 21, 22, 23, 29, 35, 41, and 42. Nos. 29, 35, collected in "V–06," all other in "IV–03," and representing in all the following localities: Blue Mt., Cinchona Hill, New Haven Gap, Latimer River, and Sir John. The specimens exhibit the wide variation in form of thallus location shown by this species. The envelopes in which the spe-

cimens came to hand were marked "Lichen," except "No. 29" —labeled "Liverwort." Spores 48 × 16 μ.

Lobaria peltigera (Del.) Wain. "Lichen No. 40, Clyde Valley, IV–27–96." Spores 32–49 × 14–16 μ. Determined by Dr. Riddle.

The Usneas of Jamaica present a very difficult problem because of the mass of described species from tropical and subtropical regions, which have been named with little or no correlated study of distribution. The determinations here made are not considered necessarily final, but are the best elucidation possible under the existing circumstances. Dr. J. A. Cushman of the Boston Society of Natural History has kindly allowed me to study, and here record, notes on the Usneas of a collection recently made by him in Jamaica. All his collecting was done in a different region of the island from that covered by Miss Cummings and Dr. Johnson, and his specimens seem to represent a flora less typically *tropical*.

Dr. Riddle writes me in connection with his determinations: "I was not at all satisfied with my dispositon" of the Usneas. We have since gone over all the material together, and there is very little doubt, as I have said, that the members of this genus from the tropics need a thorough revision.

Usnea [*Eumitria*] *implicata* Strt. "Lichen No. 24," and "25 Cinchona Hill, IV–28–03." Two small fertile specimens—spores normal. Also "Lichen No. 28, Sir John, V–1–96," sterile. Dr. Cushman's material from Newcastle and Mandeville represents this species in part. It is clearly defined by its hollow or arachnoid axis. Superficially it suggests *U. florida* (L.) Web.

Usnea dasypogoides var. *cladoblephara* Müll. Arg. "Lichen No. 26, John Crow, IV–18–93," and "Lichen No. 28, Sir John, V–1–96." This material appears to belong here. The type of this variety however, is not to be found among the Müller types either at Chambésy or at Kew.

The material No. 1*b* determined by Dr. Riddle as *Usnea laevis* (Eschw.) Nyl. is undoubtedly *U. arthroclada* Fée., which appears to be quite synonymous with *U. intercalaris* Wain. non? Kremp., *U. laevigata* Wain., and seemingly even *U. articulata* var. *di-*

morpha Müll. Arg. Nos. 7, 8 and 1*a* are referable to *U. Vrieseana* Mont. & Bosch.,[3] and are all *Pachynae,* as is Mr. Merrill's Lich. Exc. No. 109. No. 1*d* seems referable to *U. denudata* Smith (Rees, Encl. Arts. Sci Lit. **37**: 1817), a naked, subpendulous plant of the *Mesinae* described from Otaheite. Nos. 2 and 6 (in part), as is Mr. Merrill's distribution Lich. Exc. No. 159, are dicroic[4] conditions of *U. ceratina.* One example of No. 6 is a typical *U. angulata* Ach. Dr. Riddle has kindly given me the following notes on *U. jamaicensis* Ach., made by him of the type preserved at Helsingfors. Though not as yet discovered in material examined from Jamaica it seems a fitting place to give its diagnostic characters. "It is a short rather stout plant, apparently erect, 4 cm. long and 1–13 mm. thick,—scabrous with copious, very minute papillae—much branched, but with very few fibrils—apothecia *frequent,* 1.5–3 mm. lat." Dr. Elfvring has also kindly sent me a fibril section which shows it to be a *Mesinae.* Dr. Wainio considered it synonymous with *U. aspera* (Eschw.) Wain.

The material collected by Dr. Cushman, not discussed above, seems to represent the following species. It was collected in March, 1912, at Catadupa (1,200 ft.), Montego Bay (up to 500 ft.), Mandeville (2,000 ft.), and Newcastle (4,000 ft.). In part it represents *U. concinna* Strt., and *U. radiata* Strt., both *Pachynae;* in part *U.* [*Eumitria*] *implicita* Strt. as mentioned above. The pendulous species are *U. angulata* Ach., not entirely typical, and a terete, robust species suggesting *U. longissima* Ach., but having a curious brown axis, and probably *U. mekista* Strt. One example of this material having the brown axis I am unable to name, and yet entirely unwilling, under the circumstances, to describe as new.

THOREAU MUSEUM OF NATURAL HISTORY,
CONCORD, MASSACHUSETTS.

[3] Since this paper was written, Dr. Yongman of Leiden has sent me for examination a part of the type of *U. Vrieseana.* It proves to be, instead of a *Pachynae,* as designated by Dr. Zahlbruckner, a *Leptinae,* and very closely allied, if not identical, with *U. articulata* (L.) Hoffm. These specimens are therefore probably to be referred to *U. gracilis* Ach.

[4] *U. rubescens* Strt.

NEWS, NOTES AND REVIEWS

Dr. W. H. Rankin, of the department of plant pathology of Cornell University, who has in recent years devoted considerable time to chestnut canker investigations, spent July 16–18 at the Garden consulting the mycological herbarium.

Another name for the fungus which often attacks the plane-tree in spring, causing its young leaves to wither, has been discovered by A. Tonelli, who concludes that *Microstroma Platani* Eddelb. & Engelke, as well as *Gloeosporium nervisequum*, is a stage of *Gnomonia veneta*.

H. von Schrenk, in the *Annals of the Missouri Botanical Garden* for May, 1914, describes a heart-rot of the mesquite in Texas caused by *Inonotus texanus* and a trunk disease of the common lilac in the vicinity of St. Louis caused by *Corolius versicolor*. Excellent plates accompany the descriptions.

A. Maublanc and E. Rangel have recently studied the fungous parasite of coffee known as *Stimblum flavidum* and have decided that it is the sterile form of a fungus to which they give the name *Omphalia flavida*. They find that the parasite easily spreads without the recurrence of the perfect form.

In a recent number of the *Journal of Agricultural Research*, W. H. Long gives very complete descriptions and illustrations of the heart-rot caused by *Aurantiporus Pilotae*, attacking oak and chestnut, and *Grifola Berkeleyi* and *Grifola frondosa*, attacking the base of the trunk and the larger roots of species of oak.

Dr. H. Hasselbring visited the Garden July 15 on his way to Europe. He was formerly engaged in mycological studies and is at present making extensive investigations into the cause of rot in

sweet potatoes. He finds that drying the potatoes quite thoroughly before storing them largely prevents decay.

Mr. Edward T. Harper continues his report on species of *Pholiota* in the region of the Great Lakes, in the *Transactions of the Wisconsin Academy of Sciences* for 1913. The plates used in illustration are not less handsome and attractive than in former papers. A number of species of *Stropharia* are also included in this report.

Mr. Simon Davis, in a recent number of *Rhodora,* gives an account of a large number of interesting gill-fungi collected by him at Stow, Massachusetts. Many of the species are rare and local. Mr. Davis intends now to turn his attention particularly to the genus *Inocybe,* and he will be glad to receive specimens for the study of this genus from any source.

The genus "*Muciporus*" is discussed by H. O. Juel in a recent number of the *Arkiv för Botanik,* the discussion closing with a list of the known species of the Tulasnellaceae, including *Gloeotulasnella* and *Tulasnella.* In a plate showing microscopic studies of *Polyporous corticola* Fries, *Tulasnella thelephorea* is shown to be the original of *Muciporus corticola.*

Miss Elsie M. Prior, in the *Journal of Economic Biology* for 1913, gives an account of her studies on the fungous disease of beech trees known as the "snap-beech" disease, which causes the trunk to break fifteen to twenty feet above ground. This disease is attributed to *Bjerkandera adusta,* which enters the tree by wounds and destroys the wood through the activity of enzyms.

Successful artificial cultures of *Clitocybe illudens* and *Armillaria mellea* on beef-malt-agar medium have been made by V. H. Young of the University of Wisconsin, who gives a brief description of his cultures in the *Botanical Gazette* for June, 1914. The fruit-bodies obtained in the first generation proved to be quite normal, but those in the second spore generation showed striking variations in form.

The temporary suspension of vitality in the fruit-bodies of certain hymenomycetes has been recently studied by A. H. R. Buller and A. T. Cameron, who conclude that dried fruit-bodies of *Daedalea unicolor* exposed in darkness to air at room temperatures are able to retain their vitality for at least seven years, and those of *Schizophyllum alneum* will remain alive under similar circumstances for nearly six years.

In the *Journal of Agricultural Research* for May, 1914, James R. Weir describes *Fomes putearius* and *Trametes setosus* as new wood-destroying fungi in the forests of the Northwest. The former is said to be closely related to *Pyropolyporus conchatus,* but always occurs on coniferous wood, with a preference for the larch; while the latter, occurring chiefly on *Pinus monticola,* seems to be most closely related to *Hapalopilus gilvus.*

Paul W. Graff reports several additions to the basidiomycetous flora of the Philippines in the *Philippine Journal of Science for* November, 1913, among them *Exidia lagunensis, Laschia philippinensis, Lentinus candidus, Lentinus lagunensis, Volvaria pruinosa, Naucoria malinensis,* and *Bovista Jonesii,* described by him as new. From a study of fresh specimens of *Hexagona luzonensis* Murrill, he concludes that this species belongs in the genus *Laschia* and transfers it to that genus.

In the *Annals of the Missouri Botanical Garden* for March, 1914, a paper appeared by Mr. L. O. Overholts on the Polyporaceae of Ohio, which listed about 100 species found within the state, of which 78 were collected by Mr. Overholts. Duplicates of most of these species were sent to the New York Botanical Garden for determination and verification and are now in the Garden herbarium. The paper contains descriptions of all the species listed, together with notes on their occurrence, hosts, and distinguishing characters. With the aid of this paper, students should find little or no difficulty in recognizing practically all of the pileate polypores of Ohio.

In the last number of the *Annals of the Missouri Botanical Garden*, E. A. Burt presents his first paper on "The Thelephoraceae of North America," which, we trust, will be rapidly followed by other much needed contributions to the knowledge of this important and difficult family. It will be a surprise to some, perhaps, to find *Exobasidium* among the twenty genera of the Euthelephoreae recognized by the author. The twenty-three known North American species of *Thelephora* are discussed in full, with synonyms, descriptions, and a list of specimens examined. *Thelephora scissilis* from the state of Washington, *T. magnispora* from Jamaica, and *T. perplexa* from Cuba are described as new.

An important collection of fungi from Texas, consisting of 100 numbers, collected by Dr. Fredrick McAllister assisted by students of the botanical department of the University of Texas, was recently sent in for determination by Professor I. M. Lewis, head of the department. Several of the more perishable species were accompanied by good field notes. Duplicates of nearly half of the collection were reserved for the Garden herbarium. These include *Inonotus texanus, I. juniperinus, Pyropolyporus texanus, Simblum sphaerocephalum, Calvatia craniiformis, Mycenastrum corium, Phellorina californica, Gyrophragmium texense,* and several species of *Tylostoma.*

A splendid collection of gill-fungi and polypores, containing nearly one hundred specimens accompanied by excellent field notes, was recently sent to the Garden for determination by Professor W. A. Setchell, of the University of California, who was assisted by the students and instructors of the department of botany in the collection and preparation of this material. This collection forms an important addition to the Garden herbarium and adds a number of new species to the list of known California fungi. A few of the specimens will probably prove new to science when the collection is more fully studied. Attention is called to the following species: *Agaricus californicus, Agaricus crocodilinus, Agaricus placomyces, Agaricus silvicola, Clitocybe oreades, Crepidotus calolepis, Crytoporus volvatus, Gomphidius oregonensis,*

Gomphidius vinicolor, Lepiota rhacodes, Pholiota candicans, Pholiota ventricosa, Stropharia ambigua, Tricholoma sordidum, and *Venenarius muscarius.*

The death of chestnuts and oaks due to *Armillaria mellea* is the subject of a professional paper recently published by W. H. Long, forest pathologist at Washington, after a special study of this disease near New Berlin, New York, and Brim, North Carolina, in both of which localities the chestnut canker is at present absent. He finds that *Armillaria mellea* can become an active parasite under favorable conditions, especially in chestnuts and oaks, killing not only suppressed trees in the forest, but also those that are growing under more favorable conditions; and he believes that this fungus has been an important factor in the gradual recession of the chestnut in parts of the southeastern United States.

In Oregon and the adjoining states, where *Armillaria mellea* attacks fruit trees to a considerable extent, Mr. H. P. Barss has recommended the removal of all affected dead roots and bark, disinfection with Bordeaux mixture or corrosive sublimate solution, and the covering of the wounds with paint or grafting wax.

A NEW FUNGOUS PART OF NORTH AMERICAN FLORA

Volume 10, part 1, of NORTH AMERICAN FLORA, by William A. Murrill, containing descriptions of 281 species of the white-spored series of gill-fungi, appeared July 28, 1914. The contents of the part are indicated in the following table:

		Genera	Total Species	New Species
Clitocybe, in part	=	Laccaria	5	
Tricholoma	=	Melanoleuca	119	24
		Cortinellus	11	3
Pleurotus, in part	=	Pleurotus	1	
Armillaria	=	Armillaria	14	
Lepiota	=	Limacella	9	
		Lepiota	88	10
		Chlorophyllum	1	
Amanitopsis	=	Vaginata	7	
Amanita	=	Venenarius	26	2
			281	39

For the accommodation of those who desire to use currently accepted generic names, the following new combinations are proposed for species described as new or newly named in *Cortinellus, Limacella, Melanoleuca,* and *Venenarius:*

CORTINELLUS CINNAMOMEUS	= **Tricholoma cinnamomeum**
CORTINELLUS GLATFELTERI	= **Tricholoma Glatfelteri**
CORTINELLUS MUTIFOLIUS	= **Tricholoma mutifolium**
LIMACELLA ALBISSIMA	= **Lepiota albissima**
MELANOLEUCA ALABAMENSIS	= **Tricholoma alabamense**
MELANOLEUCA ANGUSTIFOLIA	= **Tricholoma angustifolium**
MELANOLEUCA AROMATICA	= **Tricholoma aromaticum**
MELANOLEUCA COMPRESSIPES	= **Tricholoma compressipes**
MELANOLEUCA EARLEAE	= **Tricholoma Earleae**
MELANOLEUCA EDURIFORMIS	= **Tricholoma eduriforme**
MELANOLEUCA FUMOSELLA	= **Tricholoma fumosellum**
MELANOLEUCA INOCYBIFORMIS	= **Tricholoma inocybiforme**
MELANOLEUCA KAUFFMANII	= **Tricholoma Kauffmanii**
MELANOLEUCA LONGIPES	= **Tricholoma longipes**
MELANOLEUCA MEMMINGERI	= **Tricholoma Memmingeri**
MELANOLEUCA NAUCORIA	= **Tricholoma Naucoria**
MELANOLEUCA ODORIFERA	= **Tricholoma odoriferum**
MELANOLEUCA PRAECOX	= **Tricholoma praecox**
MELANOLEUCA PRAEMAGNA	= **Tricholoma praemagnum**
MELANOLEUCA ROBINSONIAE	= **Tricholoma Robinsoniae**
MELANOLEUCA SUBACIDA	= **Tricholoma subacidum**
MELANOLEUCA SUBARGILLACEA	= **Tricholoma subargillaceum**
MELANOLEUCA SUBCINEREIFORMIS	= **Tricholoma subcinereiforme**
MELANOLEUCA SUBFULIGINEA	= **Tricholoma subfuligineum**
MELANOLEUCA SUBRESPLENDENS	= **Tricholoma subresplendens**
MELANOLEUCA SUBTERREA	= **Tricholoma subterreum**
MELANOLEUCA SUBTRANSMUTANS	= **Tricholoma subtransmutans**
MELANOLEUCA THOMPSONIANA	= **Tricholoma Thompsonianum**
MELANOLEUCA TOTTENII	= **Tricholoma Tottenii**
MELANOLEUCA UNAKENSIS	= **Tricholoma unakense**
MELANOLEUCA VOLKERTII	= **Tricholoma Volkertii**
MELANOLEUCA YATESII	= **Tricholoma Yatesii**
VENENARIUS LANEI	= **Amanita Lanei**
VENENARIUS ROSEITINCTUS	= **Amanita roseitincta**
VENENARIUS VIRGINIANUS	= **Amanita virginiana**

W. A. MURRILL

INDEX TO AMERICAN MYCOLOGICAL LITERATURE

Arthur, J. C., & Kern, F. D. North American species of *Peridermium* on pine. Mycologia **6**: 109–138. 30 My 1914.
Includes *Peridermium guatemalense* and *P. californicum*, spp. nov.

Bailey, I. W., & Ames, J. S. Primitive characters recalled by the chestnut-bark disease and other stimuli. Science II. **39**: 290. 20 F 1914.

Bancroft, C. K. Fungus notes. Jour. Bd. Agr. Brit. Guiana **7**: 141. Ja 1914.

Bancroft, C. K., & Hunte, R. L. A fungus disease of "peppers" (*Capsicum* spp.) *Colletotrichum nigrum*. Jour. Bd. Agr. Brit. Guiana **7**: 139–140. Ja 1914.

Berger, E. W. Whitefly control. Florida Agr. Dept. Quart. Bull. **24**: 25–54. Ap 1914.

Brown, N. A. A snapdragon wilt due to *Verticillium*. Phytopathology **4**: 217. Je 1914.

Cook, M. T. Crown gall and hairy root. New Jersey Agr. Exp. Sta. Circ. **34**: 1–14. [1914.] [Illust.]

Cook, M. T. Notes on economic fungi. Phytopathology **4**: 201–203. *f. 1, 2.* Je 1914.

Cook, M. T. Some diseases of nursery stock. New Jersey Agr. Exp. Sta. Circ. **35**: 1–24. *f. 1–15.* [1914.]

Cook, M. T., & Wilson, G. W. *Cladosporium* disease of *Ampelopsis tricuspidatum*. Phytopathology **4**: 189, 190. *f. 1.* Je 1914.

Harper, R. A. Physical factors in cleavage of coenocytes. Science II. **39**: 295. 20 F 1914.

Hedgcock, G. G. Notes on some diseases of trees in our national forests—IV. Phytopathology **4**: 181–188. Je 1914.

Hedgcock, G. G., & Long, W. H. The alternate stage of *Peridermium pyriforme*. 1–3. Washington. 12 Je 1914.

Higgins, B. B. Contribution to the life history and physiology of *Cylindrosporium* on stone fruits. Am. Jour. Bot. **1**: 145–173. *pl. 13–116.* Ap 1914.
Includes *Coccomyces prunophorae* and *C. lutescens*, spp. nov.

Jennison, H. M. Symbols vs. terminology in ascomycetes. Phytopathology **4**: 216. Je 1914.

Johnson, J. The control of damping-off disease in plant beds. Wisconsin Agr. Exp. Sta. Research Bull. **31**: 29–61. 1914. [Illust.]

Keefer, W. E. Pathological histology of *Endothia* canker of chestnut. Phytopathology **4**: 191–200. *f. 1–3.* Je 1914.

Kellerman, K. F. Relation of bacterial transformations of soil nitrogen to nutrition of citrous plants. Jour. Agr. Research **2**: 101–113. *f. 1–7.* 25 My 1914.

Kunkel, L. O. Physical and chemical factors influencing the toxicity of inorganic salts to *Monilia sitophila* (Mont.) Sacc. Bull. Torrey Club **41**: 265–293. *f. 1–2.* 30 My 1914.

Lipman, C. B. The poor nitrifying power of soils a possible cause of "die-back" (Exanthema) in lemons. Science II. **39**: 728–730. 15 My 1914.

Long, W. H. The death of chestnuts and oaks due to *Armillaria mellea.* U. S. Dept. Agr. Bull. 89: 1–9. *pl. 1–2.* 22 My 1914.

Macbride, T. H. Mountain Myxomycetes. Mycologia **6**: 146–150. 30 My 1914.

Mansfield, W. Poisonous plants. Practical Druggist **31**: 24, 25. 15 O 1913; **31**: 25, 26. 15 N 1913; **31**: 26, 27. 15 D 1913; **32**: 12, 13, 15 Ja 1914; **32**: 58, 59. 15 F 1914. [Illust.]

McCubbin, W. A. Photographing leaf spots. Phytopathology **4**: 215. Je 1914.

Melchers, L. E. A preliminary report on raspberry curl or yellows. Ohio Nat. **14**: 281–288. *f. 1–5.* 24 Ap 1914.

Merrill, G. K. Lichens from Vancouver Island. Ottawa Nat. **28**: 33–36. My 1914.
Includes *Arthonia Macounii* sp. nov.

Morris, R. T. Chestnut blight resistance. Jour. Heredity **5**: 26–29. *f. 14–15.* 28 D 1913.

Morse, W. J. Powdery scab of potatoes. Maine Agr. Exp. Sta. Bull. *227*: 89–104. *f. 44–52.* Mr 1914.

Muncie, J. H. Two Michigan bean diseases. Michigan Agr. Exp. Sta. Special Bull. 68: 1–12. Mr 1914. [Illust.]

Glomerella (*Collelotrichum*) *lindemuthiana* and *Bacterium phaseoli.*

Murrill, W. A. *Agaricus xylogenus* Mont. Mycologia **6**: 151, 152. 30 My 1914.

Peltier, G. L. Report of the Illinois [Floricultural] pathologist. Am. Florist **42**: 432–434. 21 Mr 1914.

This report is especially devoted to carnation diseases.

Pool, V. W., & McKay, M. B. *Puccinia subnitens* in the sugar beet. Phytopathology **4**: 204–206. *pl. 9.* Je 1914.

Reddick, D. Diseases of the violet. Am. Florist **42**: 496–501. 28 Mr 1914.

Reed, G. M. Influence of light on infection of certain hosts of powdery mildews. Science II. **39**: 294, 295. 20 F 1914.

Rees, H. L. Bitter rot of apples in the Pacific northwest. Phytopathology **4**: 217–219. Je 1914.

Schwarze, C. A. Relation of mosaic of the pepper and the filiform leaf of the tomato to the mosaic of tobacco. Phytopathology **4**: 42. 11 Mr 1914.

Seaver, F. J. Observations on *Sphaerosoma* and allied genera. Mycologia **6**: 103–108. *pl. 123.* 30 My 1914.

Stewart, A. Some observations on the anatomy and other features of the black knot. Science II. **39**: 291. 20 F 1914.

Stewart, A. Some observations on the anatomy and other features of the "black knot." Am. Jour. Bot. **1**: 112–126. *pl. 9, 10.* Mr 1914.

Stewart, F. C., & Rankin, W. H. Does *Cronartium ribicola* overwinter on the currant? N. Y. Agr. Exp. Sta. Bull **374**: 41–53. *pl. 1–3* map. F 1914.

Thaxter, R. Note on the ascosporic condition of the genus *Aschersonia* Montagne. Bot. Gaz. **57**: 308–313. *f. 1–7.* 15 Ap 1914.

Van Bambeke, C. Apropos du Polymorphisme de *Ganoderma lucidum* (Leys). Bull. Soc. Roy. Bot. Belgique **52**: 127–133. *pl. 3.* Mr 1914.